REMARKS

Claims 2 and 7-10 are pending in the application. Claims 2 and 7 have been amended. Claims 3-6 have been cancelled. New claims 8-10 have been added. Care has been taken to avoid the introduction of new matter.

Claims 2, 3, 6 and 7 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 5,218,352 (Endoh) in view of U.S. Patent 4,196,432 (Chihara). Claims 4 and 5 were rejected under 35 U.S.C. §103(a) as being unpatentable over Endoh in view of Chihara and further in view of U.S. Patent 5,515,074 (Yamamoto). These rejections are respectfully traversed. Applicant respectfully requests reconsideration and allowance of the claims in view of the following arguments.

The present invention relates to controlling the density of an image appearing in an LCD display by reducing the lack of clarity of the image, referred to herein as "unclearness", to a minimum. Such unclearness is caused by unselected segments of the display visibly appearing in the image along with the selected segments. The unselected segments are typically not nearly as clear as the selected segments, but are still discernable. This phenomenon is illustrated in Fig. 1 of the present application, wherein the desired number "2" appears as the number "8" due to ghost images.

The illustrated unclearness is caused by the changing of the view angle or surrounding temperature of the display. It also occurs when a potential difference exists between unselected segments and their associated common lines, even though this potential difference is much lower than the potential difference between selected segments and their associated common lines. This

phenomenon is commonly called "cross talk". Theoretically, cross talk could be eliminated by reducing the potential difference between unselected segments and associated common lines to zero, but this is impossible in the passive matrix liquid crystal display circuit to which the claimed invention relates. Applicant notes that it *is* possible in a liquid crystal display of the FE type, such as described in the cited Chihara reference (discussed in greater detail below), which uses as many switches as segments, allowing selective application of drive voltage.

It is well-known that unclearness can be minimized by reducing the effective drive voltage. As explained in the Yamamoto reference, "the higher the environmental temperature, the higher the density in the screen as a whole. This kind of display device is therefore provided with a volume [control] for controlling the density, so that a desired density in the screen can be obtained by suitably rotating the volume [control]" (Yamamoto at col. 1:15-25).

Drive circuits of passive matrix liquid crystal display circuits can be distinguished from each other by how their effective drive voltage can be reduced to meet occasional demands (i.e., to minimize unclearness under a given condition). Yamamoto and the conventional drive circuit referred to in the present application at page 2, lines 4-7, uses a volume control. Specifically, Yamamoto's invention uses a digital to analog converter 12 for providing an appropriate drive voltage selected from a temperature versus drive voltage table stored in its memory 13 in repsonse to the surrounding temperature (see Yamamoto at col. 4:54-60).

In contrast, the present invention reduces drive voltage using a drive voltage wave comprising, in each repetitive period $T_F(M)$, a predetermined number of AC square waves

having a period T (see Fig. 6 of the present application showing 4 square waves and M square waves) applied to all common lines (COM1-COM4 in Fig. 6). The effective drive voltage varies with the additional number M (0, 1, 2, 3, 4, ...) of AC square waves (T0 = T*M), for which period the voltage difference between all common terminals and segment terminals is zero. The number M is selected to meet occasional demands such as view angles at which a user looks at the LCD or the surrounding temperature, thereby controlling the density of each pixel of the image to make unselected segments barely visible (see the penultimate paragraph to page 2 of the present application).

Regarding the obviousness rejection of independent claim 2 based on Endoh and Chihara, this claim has been amended to recite that the dormancy determining controller supplies a controlled number M of AC drive voltage waves, M being an integer, each AC drive voltage wave having a period T, to add to a series of AC drive voltage waves each having a period T supplied from the two or more time-division dynamic LCD drive, the AC drive voltage waves being applied sequentially in time-division to all common terminals of the LCD display, the controlled number M varying to provide on the LCD display an image whose unclearness is reduced.

None of the references cited in the Office Action teaches or suggests, either alone or in combination, the claimed dormancy determining controller of amended independent claim 2. Endoh does not teach varying the voltage as claimed. Neither does Chihara. Chihara relates to an FE-type liquid crystal display having switching means built into each segment (see, e.g., Chihara at col. 6:46-68 and Figs. 4a-4d). Chihara's CMOS drive amplifiers 22 and CMOS drive

inverters 24a are built on opposing surfaces of the glass of the LCD. FE-type LCD's such as Chihara's use a switch alloted to each segment to drive the segment by turning the switch on and off. As a result, Chihara's display is totally free of cross talk. Since Chihara's display is very different in structure and operation from the passive matrix liquid crystal display circuit to which the present invention relates, it does not need the claimed dormancy determining controller. For the same reason, it would not have been obvious to combine Chihara and Endoh to yield the invention of amended claim 2.

Consequently, amended independent claim 2 is patentable, as is claim 7, which depends from claim 2.

Regarding the obviousness rejections of claims 3-6, these rejections are moot, since claims 3-6 have been cancelled.

Reconsideration and withdrawal of the rejection of claims 2 and 7 under 35 U.S.C. §103(a) are respectfully requested.

New dependent claims 8-10 are patentable by virtue of their dependency from independent claim 2.

Accordingly, it is believed that all pending claims are now in condition for allowance. Applicant therefore respectfully requests an early and favorable reconsideration and allowance of this application. If there are any outstanding issues which might be resolved by an interview or an Examiner's amendment, the Examiner is invited to call Applicant's representative at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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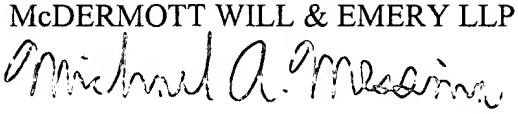

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